

NATIONAL RAILROAD PASSENGER CORPORATION

AMTRAK

ELECTRICAL OPERATING

INSTRUCTIONS

AMT-2

The instructions herein set forth are issued for the protection of Amtrak employees, property, operation of trains and locomotives in electrified territory. All employees affected by these instructions must be knowledgeable of and obey these instructions. When in doubt as to their meaning, they must apply to their supervisor for explanation. Use of the male gender throughout these rules is for convenience and clarity only. All rules apply equally to male and female personnel. These instructions supersede all previous instructions.

All employees working regularly or who have occasion to work in electrified territory must be furnished a copy of the AMT-2 and pass the required examinations before they are assigned to duty in electrified territory.

Revised and Reissued November 15, 2005

AMTRAK	ET ELECTRICAL OPERATING INSTRUCTIONS – AMT-2
SIGNATURE PAGE	

ELECTRIC TRACTION

Electrical Operating Instructions

AMT-2

Issued By:



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Approved By:



David Hughes
Chief Engineer

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ET Electrical Operating Instructions – AMT-2
C/o Deputy Chief Engineer-
Electric Traction Office
30th Street Station - Box 41
Philadelphia, PA 19104

Please include with each suggestion:

Section #

Subsection # (if any) _____

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Recommended Changes, Corrections or Questions

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SECTION 1. DEFINITIONS	

Figure 1- AMTRAK
AC ELECTRIFIED
TERRITORY

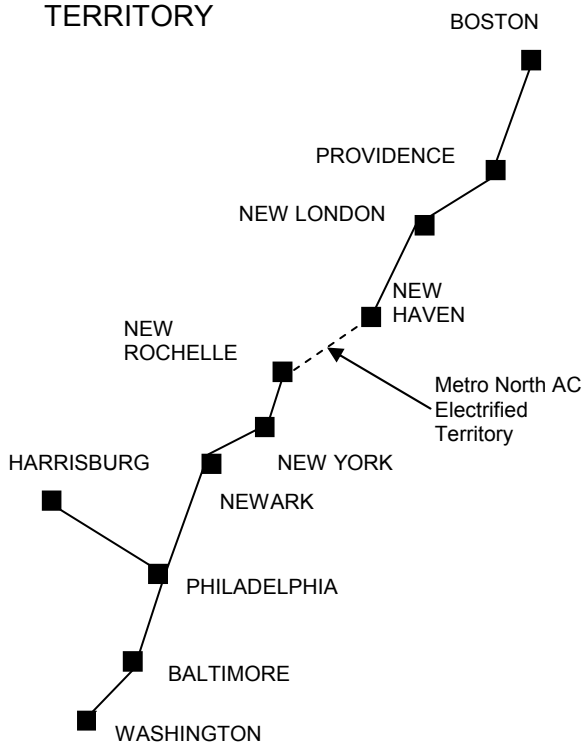


Figure 1

SECTION 1. DEFINITIONS**1 DEFINITIONS**

ARC: A luminous and potentially destructive flash or flame in or about the wires, third rail, or electric apparatus caused by the passage of electric current through the air.

AUTOTRANSFORMER FEEDER – 25 kV: An energized feeder adjacent to the catenary that utilizes autotransformers to maintain the catenary voltage at selected points.

BUS JUMPER: A cable or jumper used to transmit high voltage power for propulsion from one unit of electric equipment to another.

CATENARY SYSTEM: A system of wires suspended between poles and bridges supporting overhead contact wires (See Figures 3, 5, 6, 7 & 8, pages 2-4 through 2-6).

- A. MESSENGER WIRE:** A stranded cable attached to supporting structures from which the Auxiliary and Contact wires are suspended (See Figure 5, page 2-5).
- B. AUXILIARY WIRE:** A solid wire suspended from the messenger wire and to which the contact wire is attached (See Figure 5, page 2-5).
- C. CONTACT WIRE:** The overhead wire in the catenary system from which the pantograph shoe collects current (See Figure 5, page 2-5).

CIRCUIT: The complete path over which electric current is transmitted from and returned to its source.

CIRCUIT BREAKER/ INTERRUPTER: A device which normally operates automatically under conditions of overload, short circuit, or by remote control to energize or de-energize transmission lines, signal power lines, catenary system, third rail, or primary circuits on electric equipment so equipped.

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SECTION 1. DEFINITIONS	

CLASS “A” QUALIFIED LIST: A list of Class “A” employees qualified to operate switchgear and perform tagging tasks on electrical apparatus as required for clearances.

CLASSIFICATION OF EMPLOYEES: Employees who have passed the required AMT-2 examination and have been approved by the Deputy Chief Engineer – Electric Traction or his designated representative are classified as Class “A”, “B”, or “C”. All employees will be given a written examination of the AMT-2 and must obtain a passing score. Employees of Class “B” and “C” must pass an AMT-2 examination once every two years. All Class “A” employees must be re-examined annually. When reporting for the examination, all employees must present their manual for inspection. Employees without manuals will not be permitted to participate or audit classes. **Employees who fail this examination or allow qualification to lapse will not be allowed to perform services in Electrified Territory.** Employees qualifying in any month of one year will carry qualifications to the last month of the following calendar year.

CLASS “A”: Electric Traction employees and their supervisors, approved in Electric Traction service, competent to erect, repair, and maintain electric apparatus, and to supervise and protect other persons performing work in electrified territory. C&S employees and their supervisors competent to install, maintain and repair the high voltage signal power system under their jurisdiction.

CLASS “B”: Wreck foremen, car inspectors, technicians, and other employees approved in electric service, permitted to go on top of equipment under the conditions hereafter authorized in these instructions. C & S employees and their supervisors qualified to install third rail protection blankets for their protection only.

SECTION 1. DEFINITIONS

CLASS “C”: Maintenance of Way employees, supervisors, assistant supervisors, track foremen, C&S employees who work on signal bridges, all Train & Engine Service employees, Dispatchers, Operators, employees permitted to operate or maintain equipment, and other employees whose duties are affected by these instructions.

CLEARANCE: The written procedure followed by the Electric Traction department when it is necessary to remove power from circuits/apparatus on the electrified territory.

CONSTANT TENSION CATENARY SYSTEM: A system of wires provided with balance weight tensioning devices to maintain constant tension in the system throughout specified temperatures by compensating for conductor thermal elongation, suspended between registration assemblies supporting overhead contact wires. (See Figures 6, 7, & 8, page 2-6)

- A. BALANCE WEIGHT ASSEMBLY:** System of cable, pulleys and weights at the end of a tensioning section used to maintain constant tension in the catenary system.
- B. MID-POINT ANCHORS:** Positioned midway between balance weight assemblies in a tension section, messenger is anchored to prevent migration of the messenger towards one set of weights.
- C. TENSION LENGTH:** One wire length between terminations, from balance weight to balance weight with midpoint anchor or from balance weight to fixed termination.

CONTROL JUMPER: A cable or jumper mechanically connected between electric equipment to transmit control power.

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SECTION 1. DEFINITIONS	

CURRENT: The quantity of electricity, which flows through a cross-section of a conductor during a unit of time.

DEAD SECTION: A de-energized section of the catenary system whose limits are designated by dead section signs at locations specified in the Timetable (See Figure 14, page 3-5).

DE-ENERGIZED (DANGEROUS TO LIFE): Disconnected from the power source; electrical apparatus such as overhead wires, transformers, switches, motors, third rail, pantographs, etc., this apparatus is dangerous to life until properly grounded, or approved protection is provided.

DISPATCHER: The Dispatcher is responsible for the movement of trains within his assigned territory.

ELECTRIC ENERGY: Commonly referred to as “Power” is produced at central generating stations or power plants and transmitted at high voltage by means of transmission lines to substations where it is distributed at lower voltage to overhead catenary system, third rail, signal power lines, etc.

ELECTRIC EQUIPMENT: Locomotives and multiple unit cars operated by power received from an overhead catenary system or third rail.

ELECTRIFIED TERRITORY: That portion of the railroad equipped for electric train operation by catenary system or by third rail (See Figures 3, 5, 6, 7 & 8, pages 2-4 through 2-6).

EMERGENCY CONDITION: A circumstance, which prevents or interferes with normal train operations, or presents a hazard to life or equipment.

SECTION 1. DEFINITIONS**ENERGIZED - LIVE (DANGEROUS TO LIFE):**

Electric apparatus, such as overhead wires, substation conductors, cables, third rail, transformers, circuit breakers, disconnect switches, motors, pantographs, etc., is energized when connected to a power source.

ET TRAINEE: ET employees that are working towards craft specific qualifications.

FORMS: Documents utilized in the performance of duty to formalize safe work practices. Examples: NEC-105/ Standard Warning Tag, NEC-260/ Field clearance form, NEC-84/ Power Director clearance form, NEC-182/ Report of Switching, etc.

GROUND CONNECTION: An approved electrical connection made to the rail return circuit or other earth potential that is used to protect personnel, equipment and property when work is performed in electrified territory.

GROUNDING CIRCUIT: A circuit or apparatus may be considered properly grounded and safe to work on when approved grounds, applied by qualified personnel, have been applied.

GROUNDING SWITCH: A device that is closed to connect wires or electric apparatus metallicity to ground.

HIGH EQUIPMENT: Equipment that when on top of will place employee closer than 3 feet from the catenary system.

HOT LINE TOOLS: Tools or devices connected to one end of an insulated hand-held epoxiglass sticks for use on high voltage circuits such as switch sticks, "shotgun" type handles, ground sticks, telescopic measuring or disconnect sticks, and similar epoxiglass insulated type of equipment.

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SECTION 1. DEFINITIONS	

IMPEDANCE BOND: A device which separates signal track circuits from traction return circuits by providing a path for traction return current around insulated block joints. (See Figure 4, page 2-4).

LOAD DISPATCHER – An employee who monitors and regulates power demands for the electrification system.

MINIMUM APPROACH DISTANCE – The closest distance an employee is permitted to approach an energized or a grounded object.

PANTOGRAPH: A device located on top of electric equipment which collects electric power from the overhead contact wire by means of a sliding contact shoe (See Figures 15 & 16, pages 3-10 and 3-11).

PARALLELING STATION: - A substation located at controlled points along the territory where the catenary and feeder are connected through autotransformers to balance and maintain the catenary voltage.

PHASE BREAK: A location in the catenary where overhead wires are arranged to provide an isolated section between different sources of power

POWER DIRECTOR: The Power Director is in charge of the power system within his assigned territory.

RAIL RETURN: The combination of rails, jumpers, impedance bonds and cables that provide an electrical return path from the train to the substation.

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SECTION 1. DEFINITIONS	

SECTION BREAK: A location designed to provide a separation of circuits while allowing for a continuous collection of power from the catenary or third rail.

SECTIONALIZING SWITCH: A device, which is used to isolate or connect section(s) of the catenary, signal power or third rail.

SHOE PADDLE (Slipper): A non-conducting wedge shaped device used to insulate contact shoes from third rail.

STANDARD WARNING TAG: A safety tag describing operating restrictions to an electrical device.

SUBSTATION: A location where power is received at high voltage and changed to required voltages and characteristics for distribution to the catenary system, third rail, and other electric apparatus. It may contain transformers, rotating machinery, circuit breakers, sectionalizing switches, rectifiers, etc. (See Figure 2, page 2-4).

SWITCHING: The operation of any electrical switchgear such as circuit breakers, disconnects, switches, etc.

SWITCHING STATION: (New England Division) A substation located midway between step down substations, which provides the function of paralleling stations and switching capabilities to bypass dead sections with adjacent substation power.

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SECTION 1. DEFINITIONS	

SYSTEM VOLTAGES:

Catenary

New York - Wash.	12,000 volts – 25 hertz
Gate - New Rochelle	12,500 volts – 60 hertz
New Haven - Boston	25,000 volts – 60 hertz

Autotransformer Feeder

Gate - New Rochelle	12,500 volts – 60 hertz
New Haven - Boston	25,000 volts – 60 hertz

Third Rail 750 volts DC

Signal Power	480 volts – 60 hertz
	6,900 volts – 100 hertz
Zoo - Paoli	3,300 volts – 100 hertz
Hack - Gate	2,300 volts – 912/3 hertz

Transmission Lines	138,000 volts – 25 hertz
	115,000 volts – 60 hertz
	230,000 volts – 60 hertz

THIRD RAIL: An electrified rail located alongside and above the running rail from which a sliding contact shoe attached to the truck of electric equipment collects direct current.

THIRD RAIL PORTABLE JUMPER: A device equipped with approved insulated handles used to supply temporary power to DC electric trains or locomotives when contact with the third rail is lost.

THIRD RAIL POWER PERMIT: A documented record of switching and/or description of operations prepared by a Power Director to issue permission to a qualified employee in the field to work on or about third rail circuits.

THIRD RAIL WARNING DEVICE: A device attached between the third rail and running rail, which indicates an energized or de-energized condition by means of a strobe light and siren.

SECTION 1. DEFINITIONS

TRANSFORMER: Apparatus, which serves to increase or decrease AC voltage and transfer energy from one circuit to another.

TRANSMISSION LINES: A system of wires or cables, or both, used to transmit power at high voltage between central generating stations and substations (See Figure 3, page 2-4 and Figure 5, page 2-5).

VOLTAGE SENSING DEVICE: A device used by qualified employees to test whether circuits are energized or de-energized.

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SECTION 3. INSTRUCTIONS PERTAINING TO CUSTOMER SERVICE PERSONNEL	

2 GENERAL INSTRUCTIONS

2.1 INTRODUCTION

- 2.101** Safety is of the first importance in the discharge of duty.
- 2.102** Employees must know and obey these instructions. Obedience to them is essential to safety. Constant care must be exercised to guard against personal injury, loss of life, or damage to property. If in doubt as to their meaning, employees must apply to their immediate supervisor in charge for an explanation.
- 2.103** Employees must know and obey their Departmental Safety Rules and Instructions.
- 2.104** All occurrences or conditions, which are likely to affect electric operation, must be reported immediately to the Power Director/ Train Dispatcher.
- 2.105** Employees in electrified territory shall be familiar with the location and operation of radios and telephones.
- 2.106** When necessary to de-energize overhead wires or third rail to prevent personal injury, or damage to property, Power Director/ Train Dispatcher must be notified immediately. Person notifying Power Director/ Train Dispatcher shall identify himself and await his instructions.
- 2.107** Employees working in electrified territory must obtain permission and proper protection when working near energized wires or third rail systems. When inexperienced employees are required to work in electrified territory, the employee in charge must call their attention to the danger involved in their work.

**SECTION 3. INSTRUCTIONS PERTAINING TO CUSTOMER SERVICE
PERSONNEL**

2.108 During periods of extreme high or low temperatures, extra precautions must be taken by making additional inspections, as required, to determine that both the catenary and the third rail systems are in proper condition, free of obstructions, or broken hardware.

2.109 During periods of high wind, the Engineer will observe action of pantograph/catenary to the extent practical, and when it appears that damage may occur or that slower speed would be more desirable, he will reduce his speed at once and report to Dispatcher for instructions.

During periods of extreme weather conditions where sustained wind speeds above 50 MPH are encountered, electric trains must be instructed to operate at a reduced speed of 60 MPH and be on the look out for debris in the catenary or right of way. If sustained wind speeds in excess of 60 MPH are encountered, then the train must reduce speed to 60 MPH and proceed to the nearest terminal and stop until wind speeds fall below 60 MPH.

2.110 All occurrences and conditions likely to affect electric operation shall be reported immediately to the Power Director/Train Dispatcher, including anything that prevents the smooth sliding surface of the contact wire or third rail which would snag the end of a pantograph or third rail shoe, such as:

- Arcing
- Broken or loose wire
- Attachments out of place
- Broken overhead or third rail insulators
- Foreign objects (including kite strings)
- Loose third rail joints
- Broken or loose protection boards

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End approaches out of place
Defective anchors
Buckled anchors
Buckled third rail
Other abnormal conditions

In describing such conditions, the proper names and locations of the parts involved should be used.

- 2.111** Employees must not touch dangling wires or foreign objects (kite strings, cassette tapes etc.) in contact with overhead wires or third rail, including trees. Do not attempt to move them by any means, but take necessary precautions to protect others and equipment from coming in contact with the foreign object or dangling wires. A distance of 8' must be maintained until all wires or objects are removed. These wires or objects could be energized and can be dangerous to life. As soon as possible report their location to the Power Director/ Train Dispatcher.
- 2.112** Loose or broken impedance bond connections in the tracks must be regarded as energized (LIVE) (see Figure 4, page 2-4).
- 2.113** When an overhead wire or third rail failure occurs that may obstruct tracks, all tracks that may be affected must be protected immediately.

SECTION 3. INSTRUCTIONS PERTAINING TO CUSTOMER SERVICE PERSONNEL

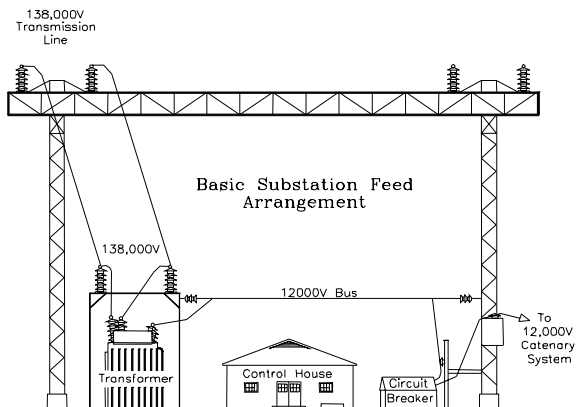


Figure 2

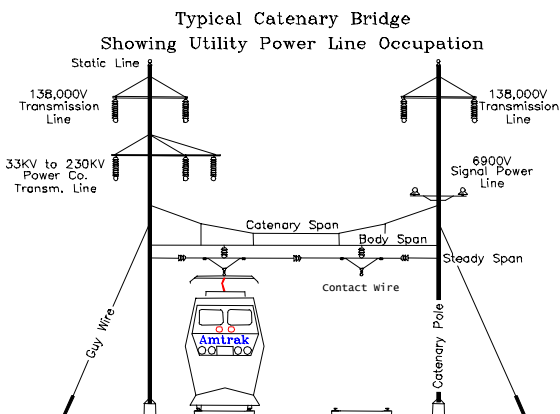


Figure 3

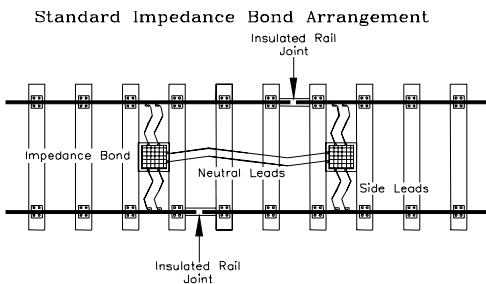


Figure 4

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SECTION 3. INSTRUCTIONS PERTAINING TO CUSTOMER SERVICE PERSONNEL	

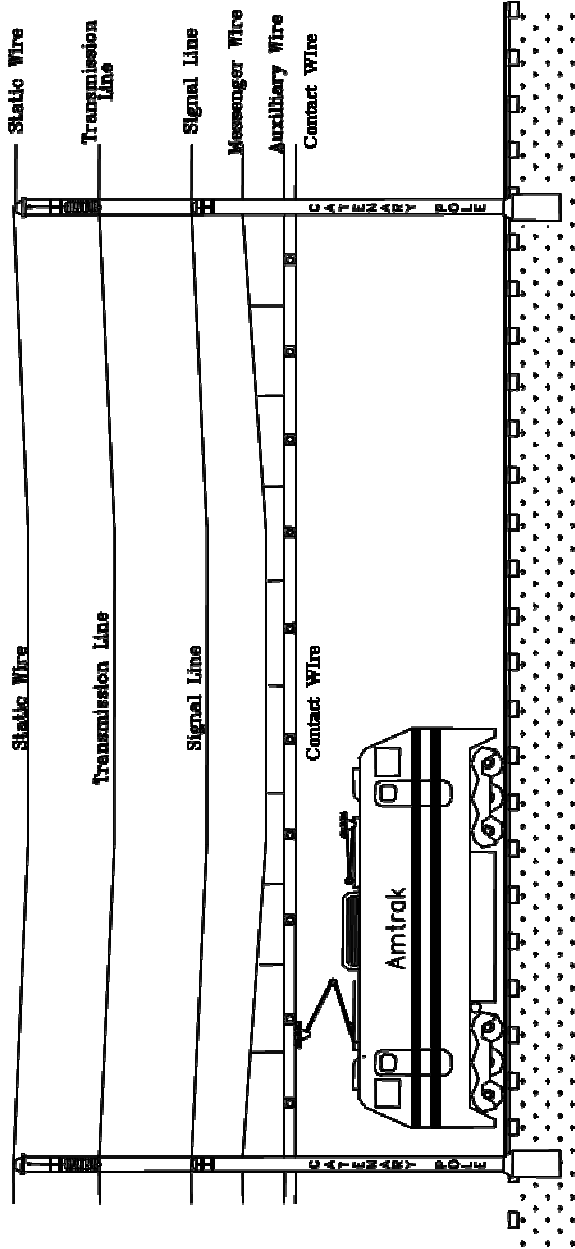


Figure 5. Typical Overhead Wire Profile

SECTION 3. INSTRUCTIONS PERTAINING TO CUSTOMER SERVICE PERSONNEL

CONSTANT TENSION CATENARY

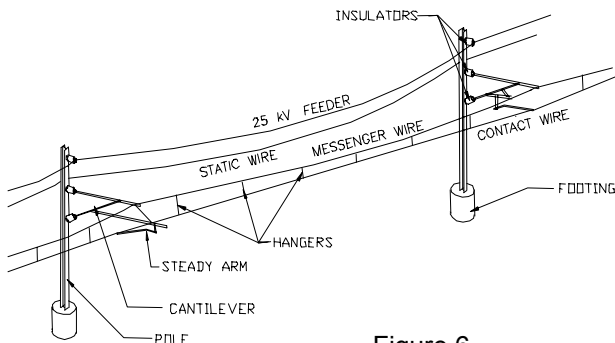


Figure 6

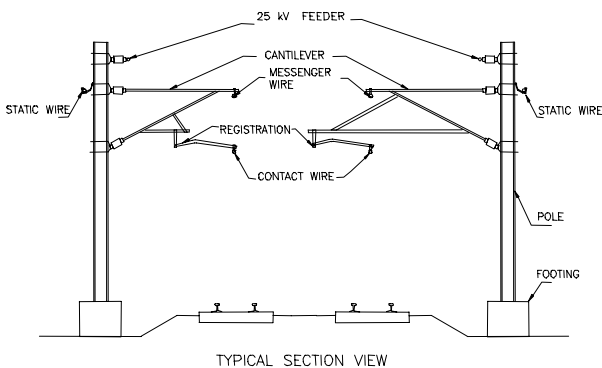


Figure 7

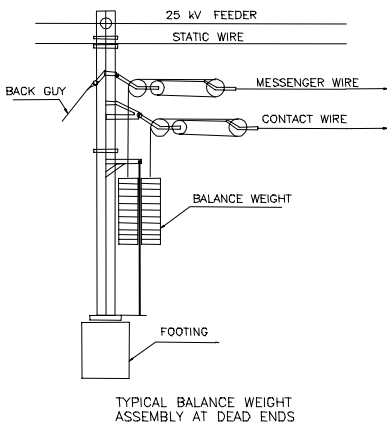


Figure 8

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SECTION 3. INSTRUCTIONS PERTAINING TO CUSTOMER SERVICE PERSONNEL	

- 2.114** When a broken wire or obstruction in overhead catenary is found which may damage a pantograph, a signal must be given to approaching electric equipment on the track involved by swinging a hand, flag or lamp vertically in a circle at full arm's length at right angle to the track.
- 2.115** Hand Signal with or without a flag or lamp, must be given as follows:

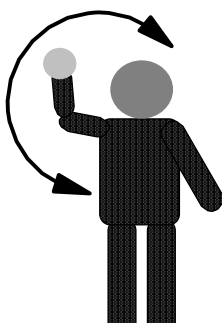


Figure 9

DROP OR RAISE PANTOGRAPH: swing vertically in a circle at full arm's length, at right angle to the track.

Indication- Drop pantographs immediately: When this signal is received, it shall be acknowledged at once by two short sounds of the electric equipment whistle and all pantographs of the train shall be dropped immediately.

After all pantographs have passed the break or obstruction, when practical, the same signal shall be given to the engineer by an employee stationed beyond the break or obstruction and the engineer may raise all pantographs.

2.2 *ENERGIZED (LIVE) CIRCUITS*

- 2.201** All overhead wires must be considered energized (LIVE) at all times except when it is known they have been de-energized, tested de-energized, and grounded.
- 2.202** Until all wires are de-energized, tested de-energized and grounded, employees shall maintain minimum approach distances. Class “A” employees will have exceptions to these distances as identified in the AMT-2 “INSTRUCTIONS PERTAINING TO ELECTRIC TRACTION DEPARTMENT PERSONNEL”:
- 8 feet from transmission wires energized above 35,000 volts
 - 3 feet from catenary system
 - 3 feet from signal power wires
 - 3 feet from utility wires known to be energized at a voltage less than 35,000 volts
- 2.203** The third rail shall be considered energized (LIVE) at all times.
- 2.204** Tools, clothing, or any part of the body shall not be brought in contact with the energized third rail. Contact shall never be made between the energized third rail and the track rails or ground. The protection board over the third rail shall not be brushed against, stepped, sat, or walked upon.
- 2.205** Minimum approach distances must be maintained between employees and exposed energized lines or equipment at all times. Minimum approach distance is measured between the employee or the end of the tool, equipment or material being

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SECTION 3. INSTRUCTIONS PERTAINING TO CUSTOMER SERVICE PERSONNEL	

used and the exposed energized parts.

- 2.206** Railroad employees should perform no work on high voltage transmission circuits unless the circuits of the railroad and utility occupations have been de-energized and grounded. If work must be done on a railroad transmission circuit and the utility company's transmission circuit cannot be de-energized, permission shall be obtained from Electric Traction Supervision, and protection of Electric Traction employees provided by the utility company as required.
- 2.207** Employees must not enter electrical substations, generating stations or electrical enclosures unless qualified or authorized.
- 2.208** Conductors, engineers, pilots, and foremen are responsible for knowing that their crewmembers understand and comply with the instructions for electrical operations. When inexperienced persons are required to work in electrified territory, their immediate supervisor shall call their attention to the dangers.
- 2.209** Tank cars or open cars on which lumber, poles, pipe, structural iron, trees, or other long material is to be loaded or unloaded, will be placed on tracks where there are no overhead wires or third rail, or on tracks where the overhead wires or third rail can be de-energized and the overhead wires grounded. Loading or unloading of flammable liquids from tank cars shall be done on tracks equipped for this service and under special regulations therefore.

**SECTION 3. INSTRUCTIONS PERTAINING TO CUSTOMER SERVICE
PERSONNEL**

- 2.210** Employees are not permitted to work near overhead wires or apparatus, except when protected by a Class “A” employee who will take necessary precautions for their safety before starting, and during the progress of the work.
- 2.211** Authorized and qualified employees who work on or about an electric circuit, apparatus or equipment must have full knowledge as to its operating voltage and application.
- 2.212** Employees are prohibited from getting on, or working on the top or roof of any freight car, passenger car, caboose, engine, or other high equipment or high lading while under the energized catenary system.
- 2.213** Employees must use only tools and appliances, which have been approved for use on the particular circuit on which they are working.
- 2.214** Wire, wet or non-rated rope, steel tape line or linen tape line containing metallic reinforcement must not be used around energized wire, apparatus or equipment.
- 2.215** Insulation, weather proofing or covering on wire, must not be depended upon for protection against shock from electrical apparatus or equipment.
- 2.3** ***DE-ENERGIZED CIRCUITS***
- 2.301** When necessary to de-energize overhead wires to prevent personal injury, loss of life, or damage to property, the Power Director must be notified immediately. Persons notifying the Power Director must await his instructions.

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SECTION 3. INSTRUCTIONS PERTAINING TO CUSTOMER SERVICE PERSONNEL	

2.302 The telephone numbers of the Power Directors and Chief Dispatchers are as follows:

Table 2-1. Telephone Numbers of Power Directors and Dispatchers

Amtrak Police		1-800-331-0008
Power Directors	Commercial	ATS
New England Division		
Zone 10: New Haven To Boston	617-345-7714	580-7714
Chief Dispatcher	617 345-7569	580-7569
New York Division		
Zone 1: Shell to Bergen (MP 3)	212-630-7684	521-7684
Zone 2: Bergen (MP 3) to Metuchen (MP 26)	212-630-7680	521-7680
Zone 3: Metuchen (MP 26) to Holmes (MP 76)	212-630-7682	521-7682
Shell to New Haven Metro North	212-340-2110	*****
Chief Dispatcher	212-630-7465	521-7465
Mid -Atlantic Division		
Zone 4: Holmes (MP 76) to Glenolden (MP 8.5) Zoo to Paoli (MP 21.3)	215-349-2276	728-2276
Zone 5: Glenolden (MP 8.5) to Gunpow (MP 79.5)	215-349-2277	728-2277
Zone 6: Gunpow (MP 79.5) to Washington Terminal	215-349-2257	728-2257
Zones 8 & 9: MP 21.3 (Paoli) to Harrisburg	717-232-3319	724-3319
Chief Dispatcher	215-349-2417	728-2417

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- 2.303** When using railroad telephone lines or radio, the words “EMERGENCY” repeated three times indicates an extreme emergency. All others using the phone, line or radio channel must yield immediately.

2.4 PANTOGRAPHS

- 2.401** When practical, condition of pantographs should be observed by the engineer and train crew at station stops. Wayside personnel should observe operating pantographs of passing trains. In case of a defective pantograph, the Power Director/ Train Dispatcher shall be notified. Engineers are responsible for taking corrective action when it is possible to do so. (See Figures 15 & 16 pages 3-10 and 3-11).

Under normal operation of single or coupled electric locomotives the rear pantograph should be up on each unit. When a rear pantograph is defective, it shall be down and the front pantograph shall be up. High Speed Trainsets should be operated with the pantograph knuckles facing rearward on both power cars for the direction of movement. On a High Speed Trainset, when a pantograph with the knuckle facing rearward is defective, it shall be down and the pantograph with the forward facing knuckle shall be up.

Trains in push-pull service may operate with either pantograph raised between Harrisburg, PA and Philadelphia, PA. SEPTA AEM-7 locomotives will normally operate with the front pantograph raised on each unit, rather than the rear pantograph. MARC trains in push-pull service that are equipped with HHP-8 locomotives may operate with either pantograph raised when

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operating on the PW Line.

An electric locomotive or High Speed Rail Trainset power car must not be operated with both pantographs raised, except when directed by Dispatcher. HST Engineers who receive a Double Pantograph instruction must raise both pantographs on the lead powercar only. (Pantograph configuration of rear powercar will not be affected.) Dispatcher must confer with Power Director before issuing Double Pantograph Instruction.

- 2.402** When units of equipment are coupled, only one of the adjacent pantographs at the coupled ends should be up. The number of electric locomotives coupled and in service will be governed as outlined in AMT-2 Instruction 3.106.
- 2.403** When there are visible defects or obstructions in the catenary that may damage pantographs, pantographs shall be dropped and catenary conditions and the location of the defect shall be reported to the Power Director/ Train Dispatcher.
- 2.404** When pantograph frames, shoes, or end horns show indications of having been struck, raise the good pantograph, lower the damaged pantograph, and report the conditions to the Power Director/ Train Dispatcher (See Figures 15 & 16, pages 3-10 and 3-11).
- 2.405** When pantographs are broken or damaged, electric equipment shall be stopped immediately, pantographs dropped and reported to the Power Director/Train Dispatcher. This includes damage to pantograph frames, shoes or end horns. If

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broken or damaged pantograph fouls the overhead wire, it may be disengaged with the pantograph pole by a Class “A” or “B” employee. The Class “A” or “B” employee may go to the roof of electric equipment and remove or secure broken pantograph, or renew pantograph components only after:

- A. Overhead wire has been de-energized, tested de-energized, and properly grounded.
- B. Position and condition of all overhead wires has been noted.

2.406 Electric equipment shall not be moved until all broken pantographs have been removed or properly isolated and secured so that no part can come in contact with overhead wires or with equipment on adjacent tracks.

2.407 Where two pantographs are located on one unit (HST power units are considered separate units), they are electrically connected; therefore, the one in the UP position energizes the pantograph that is in the DOWN position. **When either of the pantographs is in the UP position, both pantographs shall be considered energized (LIVE)** until such time as the jumpers are physically removed from between the pantographs/cars. Married pair cars have a nominal 12,000-volt bus jumper connecting the pantograph on one unit to the transformer lead-in cable on the other unit.

2.408 Pantograph shall not be raised when equipment is adjacent to turnout or crossover to prevent bouncing of wires over adjacent tracks when electric train is operating thereon. Raising and lowering pantographs at locations specified in section

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2.411, and stopping with pantographs in section breaks, is prohibited.

Employees must notify the Dispatcher before raising a pantograph on equipment other than electric engines or MU cars, such as Amtrak Inspection Car 10002 and Catenary Inspection Car MTW-100. The Dispatcher must notify the connecting dispatching district, division or railroad of the raised pantograph.

2.409 Pantograph poles are carried on all AC propelled equipment. When a pantograph pole is used to raise or lower pantographs, the pantograph pole must be used as follows:

- A. Used by Class “A” or “B” only.
- B. The pole must be clean and dry.
- C. Hands will be kept at least 3 feet from the hook.
- D. After use, unless damaged, the pantograph poles shall be returned to the proper receptacles.

2.410 Lowering and Raising Pantographs –
This is the instruction for the equipment listed below.

Electric Motor - AEM-7;

Electric Motor - HHP-8;

HST Powercars

All of the above equipment has an “MCB open” switch in the cab. To ensure “no current” during a pantograph lowering or raising, ensure that this switch is in the “open” position.

- 1. Controller in the off position.
- 2. Open the MCB.
- 3. Raise or lower the Pantograph.
- 4. Inspect raised pantograph.

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5. Close MCB.

2.411 Except as described in 2.410, to change pantographs on electric locomotives not listed above at any location, raise the down pantograph and then lower the other pantograph after insuring both pantographs are against the catenary.

- A. New York Division - Pantographs must not be dropped between west portal of North River Tunnels and east portal of East River Tunnels Sub-1 and Sub-2 tracks under L.I.R.R. tracks east of F Interlocking Station under low overhead structures, until Power Director has been advised and power has been removed.
- B. **North River Tunnels** - An electric engine, which has sustained pantograph damage in an eastward train destined for New York, must be inspected and approved by a class "A" employee, prior to being moved through North River Tunnels. When possible, such inspection must be made before train passes Hudson. If a Class "A" employee cannot be obtained in time to prevent delay to train, dead engine must be set off at Hudson. **Exception:** Electric engines that have been made dead in route due to internal fault may be moved through the North River Tunnels without inspection by Class "A" employee, provided pantographs are down but not grounded.
- C. **Mid-Atlantic Division, Harrisburg Station** - Pantographs **must not** be dropped while on Station tracks Nos. 4, 5, 6, 7, and 8, inclusive, nor at Lancaster Station while under passenger bridge, or under other close overhead structures,

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except in case of emergency.

- D. **Philadelphia, 30th Street Station** - Pantographs must not be dropped or raised while on Station tracks at 30th Street, except in case of emergency
- E. **Baltimore** - Pantographs **must not** be dropped on Station platform tracks No. 1 through 7 inclusive, track No. 1, 2 and 3 Union Tunnels, track No. 2 and 3 B&P Tunnel, and between Howard Street and Guilford Avenue, except in case of emergency

2.412 On electric equipment hauled dead in tow because of defective or damaged pantograph, the pantograph shall be secured with no part extending above the latched down position (14' 8"). All pantograph-grounding switches will be in the OPEN position. Electric equipment must not be moved until all damaged pantographs have been removed or properly isolated and secured so that no part can come in contact with overhead wires or with equipment on adjacent tracks. Any damaged pantograph found in route to New York, must be inspected by a qualified ET person prior to proceeding toward the tunnels into New York.

2.413 Electric equipment shall not be moved from electrified to non-electrified tracks or from non-electrified to electrified tracks unless pantographs are down.

2.414 When electric equipment is **derailed**, and contact is broken with rail return circuit, it must be considered energized. Engineer must drop all pantographs immediately, and close the grounding switch, if possible.

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Crewmembers must inform all passengers and employees not to board or discharge from the equipment until the pantograph(s) is (are) lowered or the overhead wire is de-energized, tested de-energized and grounded. Crewmembers must not leave the electric equipment in a manner, which permits simultaneous contact with the equipment and earth, and must prevent anyone else from doing so.

2.5 *THIRD RAIL*

- 2.501** The third rail shall be considered energized (LIVE) at all times except when it is known to be de-energized and protection is afforded by Class “A” employee.
- 2.502** The third rail is divided into sections and the power supply is controlled by circuit breakers, sectionalizing switches and continuity jumpers. Third rail on all main tracks, running tracks, sidings, and yards is normally energized (LIVE). Sectionalizing switches are normally located in enclosures alongside the third rail. Do not step, sit, walk upon, or brush against the third rail or the protection board over it. Even though a board may protect the energized third rail, there is always a chance of shock because of the presence of water, brake shoe dust, or imperfections of the board. Employees shall caution passengers and public of this possibility at time of evacuation.
- 2.503** When necessary to de-energize the third rail in an emergency to prevent personal injury or damage to property, contact the Power Director/Train Dispatcher immediately, giving your name, location and nature of the emergency and await his instructions.
- 2.504** When a section of third rail has been or is to

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be de-energized, the Power Director must confer with the employee(s) who have jurisdiction over the affected track area (Dispatcher, Train Director, Yardmaster, Engine House Foreman, or other employee specified in the Timetable). Proper instructions must be conveyed, or a Plate Order form must be issued in accordance with the procedures contained in section 3.9 of these instructions. In order to avoid bridging, multiple DC electric trains or DC electric locomotives must not be permitted to operate into or out of the de-energized section.

- 2.505** Emergency third rail portable jumpers may be used by Class “A” employees to supply power to electric equipment for short movements when contact with third rail is lost.
- 2.506** Before connecting or disconnecting emergency third rail portable jumpers, controller must be in OFF position. Compressor, motor, generator, lighting and heating switches and all train line auxiliary loads must be opened and employee using jumper must guard against injury or burning by arc when contact is made or broken.
- 2.507** Emergency third rail portable jumpers shall be applied manually first to contact shoe and then manually with the live third rail and when removed shall be disconnected from live rail first.
- 2.508** When necessary to insulate equipment from third rail, only a dry insulated shoe paddle free of dirt, oil or grease should be used. Open all auxiliary switches, and then open the main switch. Carefully insert insulated shoe paddles between all contact shoes and third rail, meanwhile guarding against

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possible resulting arc.

- 2.509** When it becomes necessary to remove the main 750-volt DC fuse on DC propelled electric equipment in third-rail territory; all shoes must be insulated from the third rail by application of insulating slippers or paddles.
- 2.510** Fuse boxes having the fuse fastened to the cover must not be opened unless all shoes are properly insulated from the third rail.
- 2.511** When connecting or disconnecting 750-volt DC bus jumpers between semi-permanently coupled ends of married-pair units, all contact shoes shall be insulated from third rail. When connecting or disconnecting other than 750-volts DC bus jumpers, it is not necessary to isolate the shoes from third rail but all auxiliary load switches on both cars shall be opened prior to handling the jumpers.

Contact must never be made with energized third rail.

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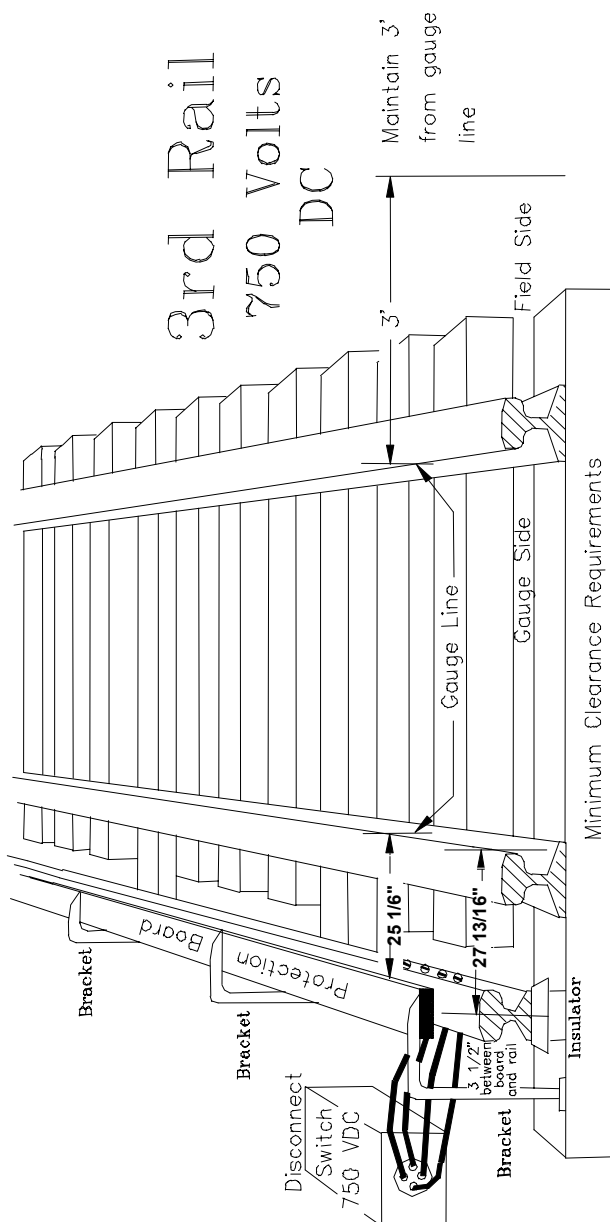


Figure 10

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2.6 *FIRST AID TREATMENT FOR BURNS AND SCALDS*

- 2.601** Send for medical assistance promptly, or if conscious and able to be transported, take to emergency room or nearest hospital. Burns, if serious, should be cared for until professional medical attention is available. Then, advise Power Director/Train Dispatcher of location where victim was taken.
- 2.602** Wherever and whenever possible, ice or ice water packs should be applied to the burn areas for at least one-half hour period, if possible, before other treatment is instituted.
- 2.603** A raw blistered surface should be protected from the air. If clothing sticks, cut around it; do not peel it off. Burns should be kept clean by applying sterile gauze compresses from the First Aid Kit, only for protection against infection.
- 2.604** Similar coverings should be lightly bandaged over dry, charred burns, but without applying oil or other liquid dressings.

2.7 *FIRES IN ELECTRIFIED TERRITORY*

- 2.701** Hand extinguishers should never be used in such a way that the stream can strike the overhead wires until power has been removed and the wires grounded. Employees must never attempt to extinguish an electrical fire using water.
- 2.702** Fire extinguishing apparatus should be available for service at all times.

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- 2.703** Fires in proximity to overhead wires may interrupt power and must be reported immediately to the Power Director/Train Dispatcher. The Power Director will, when necessary, send a Class “A” employee to the scene of the fire. When flames or when fire fighting apparatus, hose streams or loose portions of buildings may come in contact with overhead wires or third rail, power must be removed. If grounding of the overhead wires is necessary, it must be done by a Class “A” employee.
- 2.704** In case of fire on electric equipment or electrical apparatus, the power must be removed at once. The circuit must be grounded, if possible, before using fire extinguishers. If the extent of the fire requires calling private or public fire departments, they must be advised whether the equipment or apparatus is **(1)** energized, or **(2)** de-energized, tested de-energized, but not grounded, or **(3)** de-energized, tested de-energized, and grounded.
- 2.705** During a fire, all persons must keep as far as possible from energized high voltage conductors, which might fall. Arrangements must be made to have such wires de-energized, tested de-energized, and grounded.
- 2.706** When using extinguishers, the operator must consider all electrical apparatus and wires energized until it is known that the circuit has been tested and proper grounds have been applied, and must not approach within distances specified in these instructions.

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- 2.707** When discharging an extinguisher on a fire, the contents should be directed at the base of flames. After its use, a report should be made to the immediate supervisor. Replace the extinguisher immediately.
- 2.708** Use of hand extinguishers for fires around electrical circuits, unless approved for that purpose, is prohibited. Follow instructions applying to the particular make of extinguisher. When using chemical extinguishers, particularly in confined areas, care should be exercised to avoid being overcome by fumes and/or gases due to oxygen deficiency.
- 2.709** Carbon Dioxide (CO₂) Extinguishers can be used on fires involving electrical apparatus, circuits, oil or grease. Carbon Dioxide is in gaseous form and appears as a vapor when released from extinguishers. It is not a conductor of electricity and the “snow” sometimes discharged will not injure or corrode apparatus. As the discharge range of the gas from this extinguisher is approximately eight (8) to ten (10) feet and as the discharge rate is very rapid (10 to 20 seconds), the operator of the extinguisher should endeavor to approach fire with any air current at his back and get as close as possible before operating control valve.
- 2.710** Foam Type Extinguishers are effective on fires involving oil, grease, and ordinary combustible material. Foam is injurious to electrical apparatus and wiring and should not be used on electrical apparatus unless carbon dioxide or dry chemical extinguishers are not available or have been exhausted. The stream from a foam type extinguisher is a conductor of electricity and must not be used on energized apparatus or circuits.

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When piping systems permit, return oil to drainage tank. However, if the oil from a circuit breaker or transformer is flowing and has caught fire, this extinguisher could be used thereon. The foam stream should be directed in such a manner that the foam will flow over burning oil surface. Effective range of the stream is thirty (30) to forty (40) feet and approximate time of discharge is one and one half (1.5) minutes.

- 2.711** Dry Chemical Type Extinguishers are effective on electrical apparatus, oil, and grease fires. The dry chemical is a powder and appears as a vapor when discharged from the extinguisher. It is not a conductor of electricity. The range is approximately five (5) to twenty (20) feet and approximate time of discharge is ten (10) to twenty-five (25) seconds.
- 2.712** Oil Circuit Breaker and Transformer fires may cause burning oil to be thrown on other electrical apparatus, and to flow through openings. Carbon dioxide or dry chemical should be used for first application, followed by the use of sand or earth to prevent fire spreading on the floor or ground.
- 2.713** Foam type extinguisher may be used only if necessary, where it can be applied to burning surfaces and inside of tanks.
- 2.714** For air-cooled apparatus, including transformers and rotating machinery, stop all air-cooling appliances and close dampers before applying extinguisher to burning parts.

2.8 *INSTRUCTIONS FOR RELEASING VICTIM FROM CONTACT WITH A LIVE CONDUCTOR*

2.801 Extreme care must be exercised in releasing the victim from contact with a live conductor, to avoid receiving a shock yourself. Many persons, by their lack of knowledge of such matters, have been severely shocked or burned.

2.802 Release of victim from contact with live conductors if known to be 750 volts or less:

- A. Do not touch the live conductor
- B. Do not touch the victim on his bare skin while he is in contact with the live conductor.

2.803 Release of victim from contact with live conductors of unknown voltage or more than 750 volts:

- A. Do not touch the live conductor.
- B. Do not touch ANY part of the victim as long as he is in contact with live conductor.
- C. Use a fiberglass epoxy hot stick to push the wire away from the victim. Keep the hands at least (3) feet away from the victim and wire when doing this. Fiberglass epoxy poles may be found at all substations and on electric locomotives.
- D. If such a pole is not available, get the wire de-energized as promptly as possible by grounding the wire if rescuer knows how, or notify the Power Director, before attempting to release the victim.

2.804 If the victim or the live wire is in a pool of water, do not step into the water.

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3 INSTRUCTIONS PERTAINING TO TRANSPORTATION PERSONNEL

3.1 GENERAL

3.101 Pilots must promptly notify each member of the crew that:

- A. They are operating in electrified territory.
- B. Crew must keep off top of equipment under overhead wires.
- C. Crew must not let tools, material, clothing or any part of their body come near electrical apparatus.

3.102 Employees must forbid all persons from going on top of high lading or on the roof of cars under the catenary system.

3.103 When two or more electric trains stop on the same track a short distance apart, the following train must not start until the preceding train has been moving thirty seconds.

3.104 Train dispatchers, operators, conductors, and assistant conductors must not line tracks for electric trains for movements to unwired or wired tracks protected by a plate order, unless all pantographs are down and secured with manual ground switches closed, unless otherwise instructed. All concerned, including the Power Director involved, must be informed as to the movement to be made. Power Director must inform field forces protected by Plate Order.

MOTOR STOP SIGNS ARE PLACED IN THE CATENARY TO INDICATE THE END OF CONTACT WIRE. ELECTRIC ENGINES AND MU EQUIPMENT MUST NOT PASS THE SIGN WITH THEIR PANTOGRAPH(S) UP.

**AC
MOTOR
STOP**

Figure 11

3.106 Electric Engines — The operation of more than two (2) electric locomotives, except MU cars, in a train is prohibited. When there are more than two electric locomotives in the consist, the remaining units will not provide traction power. AEM-7-DC units will be live-in-tow, unless defective. AEM-7-AC units, HHP-8 units and High Speed Trainsets will be dead-in-tow (pantograph(s) down) with 480 V power to locomotive(s) or train. Locomotives or trainsets in tow must be moved as follows:

- A. AEM-7-DC Units: Pantograph is to be up, unless damaged. 27-Point MU cables and 480 V cables must be connected between units. Brake pipe, main reservoir, and all MU hoses must be connected. Main circuit breaker is to be closed. HEP and APL converters are to be switched off, and traction power is to be “isolated”. Traction motors should not be cut out.
- B. AEM-7-AC Units: Pantograph(s) must be down. 27-Point MU cable and 480 V cables must be connected between units. Brake pipe, main reservoir, and all MU hoses must be connected. The dead engine switch in the machine room

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must be set to “dead”. Do not use the pantograph down switch on the dead unit to lower the pantograph. This is accomplished by the dead engine switch.

- C. HHP-8 Units:** Pantograph(s) must be down. 27-Point MU cables and 480 V cables must be connected between units. Brake pipe, main reservoir, and all MU hoses must be connected. The emergency magnet valve must be set to “IN”, and the pantograph selector must be set to “off”.
- D. High Speed Trainsets:** HST’s must not be coupled together. When a locomotive tows a HST, pantographs must be down, and 480 V cables must be connected between locomotive and trainset. Main reservoir and brake pipe must be coupled. The emergency magnet valve must be set to “IN”, and both power cars must have pantograph selector set to “off”.

3.107 Electric MU Cars - The operation of more than 12 electric MU cars in a train is prohibited.

MU engines equipped with a pantograph pressure switch must have the switch in the **low** pressure position while on Amtrak property.

3.108 Maximum number of cars (including dead cars) for SEPTA IV Silverliner cars (MA1F), as well as Jersey Arrow II and III cars are as follows:

New York to Washington, D.C.	12
Philadelphia to Harrisburg	10

3.2 PHASE BREAK SIGNS AND INDICATORS

- 3.201** Phase breaks and phase break indicators are located as specified in the Timetable. The phase break signs are located on the first catenary pole in advance of a phase break (See Figure 13, page 3-5).
- 3.202** Position light phase break indicators of the type shown in Figure 12 (page 3-5) are located in advance of the phase break sign. When an indicator is lit, a section of the phase break is de-energized, and all electric equipment approaching a phase break on the affected track or tracks, as designated by Timetable, will be governed by the following:
- A. Electric equipment equipped with an MCB, will place the controller in the off position, open the MCB, keeping it in that position until the phase break is passed.
 - B. One unit of electric equipment not equipped with an MCB, with one pantograph up: Place controller in OFF position before entering the phase break, keeping it in that position until after the phase break is passed.
 - C. One unit of electrical equipment with both pantographs up, or multiple electric equipment, not equipped with an MCB: Place controller in OFF position, and drop pantographs before entering phase break. Keep them in that position, until after phase break is passed. Speed shall be reduced to 60 MPH before raising pantograph.

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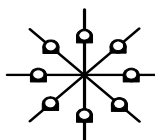


Figure 12



Figure 13

3.3 DEAD SECTIONS

- 3.301** Dead sections are installed in overhead wires at certain locations specified in the Timetable. Dead section signs designate the limits of these sections. (See Figure 14).



Figure 14

- 3.302** All electric equipment approaching a dead section will be governed by the following: Place controller in OFF, open the MCB, keeping it in that position until after the dead section is passed.

3.4 DROP PANTOGRAPH INSTRUCTION FORM D

- 3.401** When catenary has been damaged and it has been determined that electric equipment can be safely operated under such catenary provided pantographs are down, the Dispatcher will issue a Drop Pantograph Instruction Form D, indicating track involved and limits of territory through which pantographs shall be kept down.

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- 3.402** Prior to entering the limits specified in the Drop Pantograph Instruction, all pantographs shall be tested and visually observed to insure that all will drop. When any pantograph fails to operate properly, or Drop Pantograph Instruction cannot be complied with, the equipment shall be stopped immediately and condition reported to the Dispatcher.
- 3.403** When any pantograph fails to drop at limit specified in the Drop Pantograph Instruction Form D, and an employee is stationed at the limit location, observing the train, he shall give a stop signal to the train and equipment shall be stopped.
- 3.404** Speed of thirty (30) miles per hour shall not be exceeded within the limits specified, unless otherwise stated in the Drop Pantograph Instruction Form D.
- 3.405** When Drop Pantograph Instruction Form D is in effect, the pantograph DOWN button shall be left in the DOWN position between the limits specified in Drop Pantograph Instruction Form D.
- 3.5 CATENARY POWER OUTAGES**
- 3.501** When an extended catenary power outage occurs, train(s) within the affected catenary circuit must be instructed to stop and examine pantographs for damage, unless the cause of the outage has already been determined.
- 3.502 Pantograph Damage Found** - If pantograph damage is found, follow the instructions listed in section **3.6**.
- 3.503 No Pantograph Damage Found - Power**

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Immediately Restored - If no pantograph damage is found, and catenary power is immediately restored, the train(s) within the affected catenary circuit may be authorized to proceed at Normal Speed. The dispatcher must direct the first train on the affected track or an adjacent track, through the limits of the power outage, to inspect for catenary damage on the affected track. Inspection of the catenary must follow the instructions outlined in 3.505 "Inspecting for Catenary Damage".

3.504 No Pantograph Damage Found - Power NOT Immediately Restored - If no pantograph damage is found, but catenary power **cannot** be restored immediately, the Dispatcher must direct trains operating on all tracks through the affected area to inspect for catenary damage on the track they are operating. The catenary inspection must follow the instructions outlined in 3.505 "Inspecting for Catenary Damage". The inspection requirement must remain in effect on all tracks through the affected area until removed by the Power Director.

3.505 Inspecting for Catenary Damage – When instructed to inspect for catenary damage, trains must:

- A. Inspect the catenary for defects on the track they are operating (or an adjacent track if so instructed) within the limits specified.
- B. Be prepared to drop pantographs if a defect is observed.
- C. Do not exceed 30 MPH while making the inspection unless otherwise directed by the Dispatcher or Operator.
- D. Report the results of their inspection to the

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Dispatcher or Operator when clear of the specified limits.

- E. The Dispatcher must not permit trains to enter the affected area without receiving instructions to inspect for damage. He must advise the Power Director of the results of the inspection.

3.506 ELECTRIC POWER RESTRICTIONS DUE TO POWER SHORTAGES

When one or more of our power suppliers advise us that they are unable to provide sufficient capacity for our electric service, the Dispatcher (or Operator when authorized by the Dispatcher) will verbally notify trains that 5.506 Instruction is in effect.

Example: AMT-2 *Instruction 3.506 is in effect between New York and Trenton.*

Trains that receive this notification will be governed by the following acceleration restrictions, between the locations named:

Equipment	Controller Position/Power Effort Must not Exceed:	Notes
HST Power cars	50,000 foot pounds	...
HHP-8 Engs	50,000 foot pounds	...
AEM-7 (AC) Engs	7,500 ft. lbs. per traction motor	...
AEM-7 (DC) Engs	1,500 Amps	...
ALP-44 Engines	1,500 Amps	...
ALP-46 Engines	1,500 Amps	1
MU Cars	P-2 Position	...
Note 1: Total line amperage can be viewed on ITU Propulsion Screen.		

This restriction remains in effect until the

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train clears the affected area, unless the restriction is verbally cancelled en route by the Dispatcher (or Operator when authorized by the Dispatcher).

3.6 PANTOGRAPH DAMAGE

3.601 Whenever pantograph damage is found, regardless of whether a catenary power outage has occurred, the Dispatcher must immediately determine the type of damage sustained and notify the Power Director. The Dispatcher must seek the guidance of the Power Director regarding train movement restrictions.

3.602 Carbon Strip Damage only - If only carbon strip damage is found, the Dispatcher must determine what trains utilized the affected engine during the previous 8 hours, and arrange to have the routes of these trains patrolled at Normal Speed for possible catenary damage.

3.603 Damage Other Than Carbon Strip Damage – If a train is stopped with pantograph damage other than carbon strip damage, the Dispatcher must immediately determine the location on the train as well as a point 5 miles to the rear of the train's location. He must direct trains on all tracks to inspect for catenary damage on their track within these limits. Inspection of the catenary must follow the instructions outlined in 3.505 "Inspecting for Catenary Damage".

3.604 If it is determined that a catenary power outage occurred on the route traveled by the train with pantograph damage, or an unusual displacement of the catenary occurred, an attempt must be made to

SECTION 3. INSTRUCTIONS PERTAINING TO CUSTOMER SERVICE PERSONNEL

determine the location of the train when the outage or unusual catenary displacement occurred and the limits of the inspection for catenary damage will be extended to include the location of the occurrence(s).

- 3.605** This inspection requirement must remain in effect on all tracks through the affected area until removed by the Power Director.

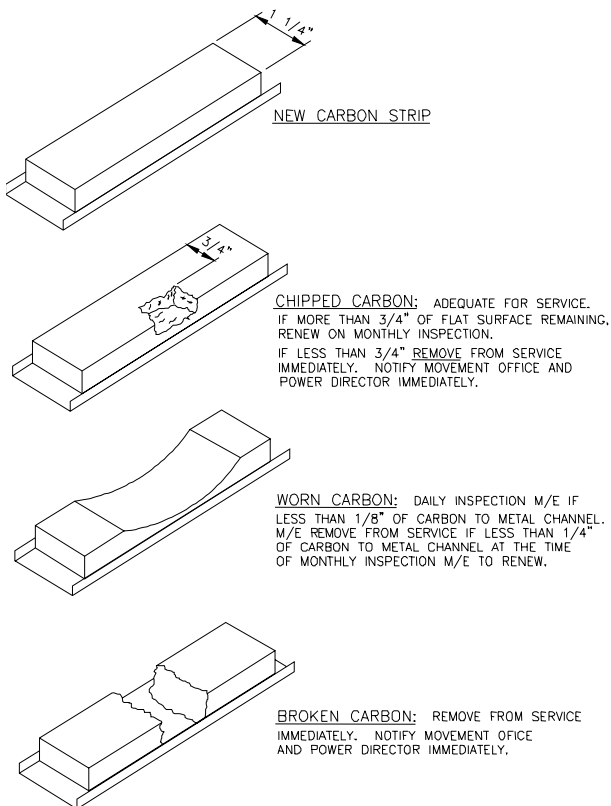
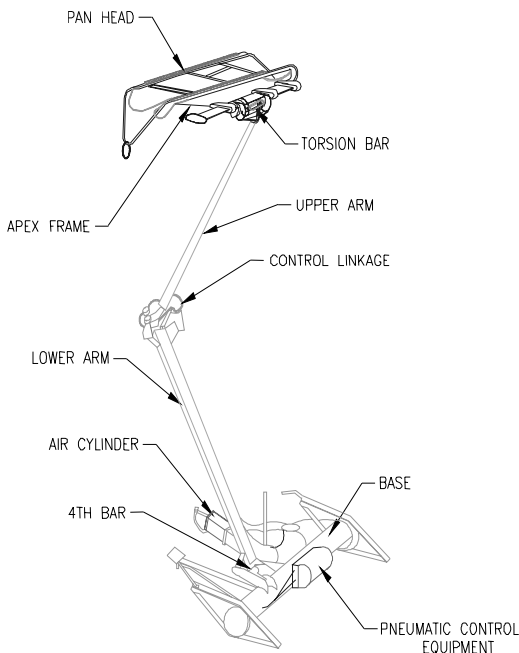


Figure 15

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TRANSTECH
HI-SPEED PANTOGRAPH

Figure 16

3.7 TRANSFER OF EMPLOYEES OR PASSENGERS BETWEEN EQUIPMENT ON ADJACENT TRACKS

3.701 Due to a difference in electrical potential between equipment, the following must be adhered to when transferring employees or passengers:

When spotting one train adjacent to another to transfer employees and passengers, jumper cables must be applied prior to transfer. If jumper cables are not available,

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simultaneous contact between equipment must be avoided.

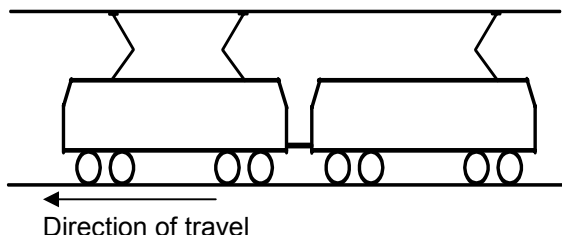
3.702 Power shall not be applied on either train until the transfer process is complete.

3.703 In third rail territory, Power Director/Train Dispatcher shall be notified in order to have third rail de-energized before the transfer occurs.

3.8 SLEET INSTRUCTIONS

3.801 When sleet formation on the pantograph or catenary system causes excessive arcing, the Engineer shall promptly report condition to Dispatcher, who will issue a **Double Pantograph Instruction**.

3.802 With double pantograph instruction in effect, electric equipment operating singly shall run with both pantographs up, except through **Phase Breaks** when lit and **Dead Sections**. Multiple Electric Engines coupled shall run with both pantographs up on leading unit and rear pantograph up on each trailing unit except through phase breaks when lit (See Figure 17 page 3-12).



Double Pantograph Instruction

Figure 17

3.803 Patrol trains, consisting of five or more multiple unit cars or two electric locomotives coupled, will be assigned to remove sleet

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from contact wires. In case of heavy sleet, it may be necessary to open the main circuit breaker on the leading multiple unit car or locomotive, in order to reduce arcing.

- 3.804** When contact wire is heavily coated with sleet, patrol train speed shall not exceed thirty (30) miles per hour in order to effect removal of sleet from the contact wire with minimum wear on the pantograph shoe.
- 3.805** When practical, electric engines and multiple unit cars in yards, storage tracks, or standing at any point, should have pantographs lowered and raised frequently to prevent accumulation of sleet. Electric equipment left unattended shall have pantographs lowered to prevent arcing caused by sleet formation.
- 3.806** When a pantograph lowers due to sleet, or when sleet load on a pantograph becomes excessive, resulting in heavy arcing between shoe and wire, controller must be shut off and an attempt made to raise and lower the pantograph several times. If this fails, the Train Dispatcher must be advised and arrangements made to de-energize and ground catenary before sleet can be removed.
- 3.807** During sleet storms, pantograph shoes of all electric engines and MU cars will be inspected frequently and at the end of each trip.
- 3.808** Upon instruction by Division Engineer, wire trains/cat cars will be manned and held available at advantageous points for immediate call during sleet storms.
- 3.809** When it is determined that sleet conditions no longer exist, the Train Dispatcher will

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remove the double pantograph order.

3.9 PLATE ORDER PROCEDURES

3.901 When it becomes necessary to remove a track from service for electric operation, the Power Director must request from the Train Dispatcher or employee having jurisdiction over the affected area, a Power Plate Order form NRPC-2990. When requesting a Power Plate Order, the Power Director must specify the plate number, location name, and page number for the required Power Plate Order. Note: Dispatchers working in territory where requests and approvals for power removal are executed electronically (e.g. SCADA) need not complete a Plate Order Form when the electronic system is operational.

3.902 The Train Dispatcher or employee having jurisdiction over the affected area, must determine if the Power Plate Order requested can be issued and approve the request and apply blocking devices to all signals and switches providing access to the affected track(s). After blocking devices have been applied to the signals or switches providing protection for the Power Plate Order(s) requested, the Train Dispatcher or employee having jurisdiction over the affected area must issue a Power Plate Order to the Power Director.

3.903 In the event of an emergency, the Power Director will inform the Train Dispatcher or employee(s) who have jurisdiction over the affected area, giving them identification of affected power plates. The notified employee(s) will immediately arrange to hold affected trains clear of the power plates involved and complete a Plate Order form.

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- 3.904** When work is completed and employees and equipment are clear of catenary and grounds removed, the Power Director shall be notified, so that the circuit may be energized. The Power Director must notify the Train Dispatcher or employee(s) who have jurisdiction over the affected area, when the circuit is energized for normal service so that the Catenary Plate Order involved may be canceled.
- 3.905** Power Plate Issuance Procedure:
- A. All requests or instructions described below must be repeated by the person receiving the request or instruction, and acknowledged by the person giving the request or instruction, before being acted upon. Trains with pantographs must refer to rule 3.906.
 - B. Class “A” employee makes request to Power Director for catenary or third rail circuit(s) to be de-energized.
 - C. Power Director determines the proper power plate(s) for de-energized circuit(s).
 - D. Power Director requests plate(s) from the Train Dispatcher or employee(s) who have jurisdiction over the affected area.
 - E. The Train Dispatcher or Employee(s) who have jurisdiction over the affected area must complete a Plate Order form, and must comply with its requirements. Plate Orders must be numbered consecutively each day, beginning at midnight. Before making the Plate Order effective, employee(s) must determine that trains specified in the Plate Order are clear of affected power plate(s).
 - F. Dispatchers must issue the Plate Order to

**SECTION 3. INSTRUCTIONS PERTAINING TO CUSTOMER SERVICE
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any affected Interlocking Stations. Before the Plate Order is made effective, Dispatchers and Operators must apply blocking devices to interlocking control mechanisms to prevent entry into the affected area, and must record blocking device application on the Plate Order form. Where provided, plate lights must be illuminated and plate boards must be displayed to designate the areas affected by the Plate Order. All Train Directors, Assistant Train Directors, Operators and Levermen at affected Interlocking Stations must read and understand the requirements of the Plate Order.

- G. After issuing the Plate Order, Train Dispatcher or employee(s) who have jurisdiction over the affected area will give the Power Director permission to remove power from affected plate(s).
- H. Power Director will then remove power and issue clearance to Class "A" employee.
- I. When work is complete, Class "A" employee contacts Power Director and releases clearance.
- J. Power Director restores power and releases plate(s) to the proper person(s).
- K. Train Dispatcher or Employee(s) who have jurisdiction over the affected area will then cancel the Plate Order.
- L. Cancelled Plate Order forms will be maintained by the Transportation department.

3.906 Movements Through Area Affected By Plate Order:

- A. Before a signal is displayed or permission

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is given for movement into an area affected by a Plate Order, the employee(s) controlling the movement must ascertain that the train to be moved does not have a raised pantograph, if an AC plate is in effect, or an engaged third rail contact shoe, if a DC plate is in effect. The temporary removal of blocking devices to permit movements not affected by the Plate Order must be recorded where indicated on the Plate Order form. Blocking devices must be reapplied as soon as movement has been completed, and recorded on the Plate Order form.

- B. The Dispatcher or employee(s) who have jurisdiction over the affected area, when authorized by the Power Director, may issue a temporary release from one or more plates. When a temporary release is issued to an Interlocking Station, the receiving employee must advise all Interlocking Station personnel. Blocking device removal must be recorded where indicated on the Plate Order form. Before power is once again removed from plate(s) affected by the temporary release, it must be determined that trains specified in the Plate Order are clear of affected plate(s), blocking devices must be re-applied and recorded where indicated on the Plate Order form, and all Interlocking Station personnel advised.

3.10 OPERATION OF REMOTE CONTROL BOARDS

- 3.1001** In certain interlocking stations, or other locations, remote control boards have been installed for the operation and supervision of electric traction apparatus. Control switches with red and green indicating lamps and other devices are mounted on these boards.

**SECTION 3. INSTRUCTIONS PERTAINING TO CUSTOMER SERVICE
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3.1002 Under no circumstances shall any control switch or other device be operated except in accordance with instructions given by the Power Director and only by employees who have been properly instructed on the operation of the remote control board at that location.

3.1003 At the beginning of a tour of duty, the employee shall:

- A. Visually check indications on the control boards.
- B. Depress ground lamp button (when equipped), and note any difference in brilliancy of ground lamps. Depress Lamp Test Button, (when equipped) and observe lamps for burnt out bulbs and replace bulbs when applicable.
- C. Note readings on voltmeter and other indicating meters.
- D. Any abnormal condition noted at this time or during the tour of duty shall be reported immediately to the Power Director.

3.1004 On a control switch, a red light denotes the closed position and a green light denotes the open position. When handle of the control switch is in locked-out position, there is no light indication. On a control switch equipped with a mechanical target, the color of the target indicates the position to which the control switch was last operated and does not necessarily denote position of the apparatus controlled. When operating control switches in accordance with instructions from the Power Director:

- A. The employee shall repeat instructions as given, then perform operations in the order received.

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- B. The employee shall open control switch, lock out the handle, and apply blocking device with red tag completed as follows (See Figure 18, page 3-21):

 1. Name or number of apparatus.
 2. Number of clearance on which work is to be done.
 3. Name of person in charge of work.
 4. Signature of employee placing tag.
 5. Time and date tag is placed.
 6. Location.
- C. Employee shall then report the operations to the Power Director who will verbally repeat or correct the operations reported.
- 3.1005** To close apparatus, the control handle must be held in closed position approximately three (3) seconds. When red light indication is obtained, apparatus is closed and completion of instruction shall be reported to the Power Director. When red light indication is not obtained, control handle shall be restored to neutral position and condition reported immediately to Power Director.
- 3.1006** To open apparatus, the control handle must be held in open position approximately three (3) seconds. Unless otherwise instructed by Power Director, handle shall be restored to neutral position to observe green light indication. In the operation of signal power line circuit breakers, Power Director may instruct the employee only to lock out the control handle to avoid automatic reclosing of circuit breaker, which might occur if handle were restored to neutral position. Completion of the operation shall be reported immediately to the Power Director.
- 3.1007** When apparatus opens automatically, as indicated by alarm bell ringing and light indication changing from red to green or

**SECTION 3. INSTRUCTIONS PERTAINING TO CUSTOMER SERVICE
PERSONNEL**

transformer temperature alarm sounds, employee shall immediately notify the Power Director and follow his instructions.

3.1008 Tags and blocking devices shall not be removed except as instructed by the Power Director. Employee shall complete removed tags as follows (See Figure 18, page 3-21):

- A. Time and date tag is removed.
- B. Name of employee that removed tag.
- C. Operation and time shall be reported promptly to the Power Director.

3.1009 All red warning tags, which have been used as outlined in the foregoing, shall be forwarded daily to the Assistant Division Engineer Electric Traction.

3.1010 Interlocking station operators shall be governed by the Power Plate in effect, holding trains as needed under direction of the Dispatcher.

SECTION 3. INSTRUCTIONS PERTAINING TO CUSTOMER SERVICE PERSONNEL

DO NOT OPERATE

THIS SWITCH OR APPARATUS

MEN WORKING ON LINE

Figure 18

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SECTION 4. INSTRUCTIONS PERTAINING TO MECHANICAL DEPARTMENT EMPLOYEES	

4 INSTRUCTIONS PERTAINING TO MECHANICAL DEPARTMENT EMPLOYEES

4.1 *WORKING ON ELECTRIC ENGINES OR MULTIPLE UNIT CARS*

4.101 Work must not be done on roof of any electric engine or multiple unit car or other equipment under overhead wires except as permitted by these instructions, and then only by or under the supervision of a Class “A” or “B” employee.

4.102 All electric engines and multiple unit cars under overhead wires must be considered energized (LIVE) except when it is known that all pantographs are down and grounding switches are closed (in) or that overhead wires are de-energized (dead) and properly grounded.

4.103 Work must not be done on any circuit of an energized multiple unit cars except when the switch disconnecting that circuit is open. Fuses in heater circuit must not be replaced while pantograph is up.

4.104 An assigned employee must know that all pantographs are down and all hand-operated grounding switches are closed before and during the time that the following work is performed on electric equipment under overhead wires:

- A. Renewing fuses other than those in control voltage circuits.
- B. Cleaning the outside of equipment, except when cleaning the Engineer’s window or pulling equipment through a train washing machine.

**SECTION 4. INSTRUCTIONS PERTAINING TO MECHANICAL
DEPARTMENT EMPLOYEES**

- 4.105** Before any person starts to perform any of the above work, he must obtain permission from the Class “A” or “B” employee in charge. After work is completed, the Class “A” or “B” employee must know that all persons are clear and have been properly informed before opening grounding switches.
- 4.106** When necessary to inspect or test single or coupled energized electric engine or multiple unit cars, a Class “B” employee must take charge, and others assisting with such work must be governed by his instructions.
- 4.107** Repair work on or near main power circuits on electric engines or multiple unit cars must not be performed under energized (LIVE) wire until pantographs have been lowered, grounding switches have been closed, and standard warning tags have been applied by Class “A” or “B” employee in charge. Other employees performing this work must obtain permission from Class “A” or “B” employee before starting work, and must advise Class “A” or “B” employee when work is completed. Standard warning tags must be removed by the employee who applied them. Grounding switches must not be opened until tags are removed and it is known that all persons are clear of main power circuits.
- Work must not be done on any roof of locomotives, multiple unit cars, or equipment under overhead wires except as permitted by these instructions, and then only by or under the supervision of a Class “A” or “B” employee.
- 4.108** Married pair units must have pantographs lowered and grounding switches closed on

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all pantographs before semi-permanent control and power bus jumpers are applied or removed.

4.109 When necessary to inspect or test single or coupled energized electric equipment, a Class “B” employee must take charge and others assisting with such work must be governed by his instructions.

4.110 Inspection and repair work on electric equipment under overhead wires at terminals and inspection and servicing locations not governed by yard masters, shall be performed in accordance with the following procedures:

Under de-energized and grounded wire at locations equipped with grounding devices:

A. Class “B” employee shall de-energize and ground the overhead wire by opening the catenary disconnect switch and closing the catenary ground switch. The Class “B” employee must lock the catenary ground switch in its grounded position and retain the key in his possession. The wire shall also be grounded by the use of hand applied grounding devices. All employees assigned to work on the roof or the Main High Voltage Circuitry shall apply their personal danger tags to the designated location prior to starting assignment.

B. When work is completed, each employee shall remove his personal danger tag. After all personal danger tags are removed, and the area is clear of personnel, tools, and has been inspected, the Class “B” employee may remove all catenary hand grounds first, open ground switches and energize the overhead wire.

**SECTION 4. INSTRUCTIONS PERTAINING TO MECHANICAL
DEPARTMENT EMPLOYEES**

- C. These are the minimum requirements for protection of personnel and do not cover all protection requirements. Additional requirements for protection of inspection and repair work, set forth by the department in direct charge must also be followed.

4.111 No repair work or cleaning shall be performed on main power circuits of electric equipment while the units are energized. When repair work or cleaning of main power circuits are required:

- A. Class “B” employee shall lower all pantographs and close (in) all grounding and latching switches.
- B. All employees working on this equipment will place personal danger tags in designated area before starting work and remove said tags when work is completed. Personal danger tags must be removed by the employees who applied them. Grounding switches shall not be opened until all tags are removed and it is known that all persons, tools, and working materials are clear of main power circuits.

4.112 In no case may an employee go on top of electric equipment unless qualified Class “A” or “B” or under the supervision of Class “A” or “B” employee.

4.113 Pantographs must not be raised until it is known that all persons, tools, and equipment in the vicinity of the electric equipment are clear of all circuits and it is understood that the equipment is to be energized.

4.114 Married-pair units have the nominal 12,000 volt power bussed overhead between the

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semi-permanently coupled ends, and roof areas on both cars must be considered energized until the pantograph of the married-pair is locked down by the ground switch. Removal of the Bus Jumper between these cars does not isolate the second car for access to or working on the roof.

- 4.115** When necessary to remove or apply control jumpers between electric engines, all pantographs must be lowered. If not practicable, open generator switch, battery switch, and air compressor switch during time of insertion or removal of jumpers. When two or more electric engines (except MU engines) are in use in multiple and electrical trouble develops in which it is necessary to haul one of the engines dead, the control jumpers must be removed from the defective engine to avoid damage which may result because of wiring defects.

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5 INSTRUCTIONS PERTAINING TO MAINTENANCE OF WAY PERSONNEL

5.1 *WORKING NEAR OVERHEAD WIRES*

5.101 Amtrak employees working near any overhead wire must follow these instructions and perform work in accordance with instruction 2.202.

5.102 Persons other than railroad employees attempting to work closer than 15 feet to overhead wires or apparatus must meet one of the following conditions:

- A. Employee is qualified in the electrical trade and a work plan has been approved by the Deputy Chief Engineer / Electric Traction or his designated representative.
- B. Protective measures are taken to prevent persons or equipment from coming in contact with exposed energized overhead lines and apparatus, such as guarding, isolating, protective barriers, and material handling techniques. The Deputy Chief Engineer /Electric Traction or his designated representative must approve the measures.
- C. Protection by a Class “A” employee is provided.

5.103 Emergency repair work of any nature to clear up defects and permit equipment to be moved to an established location for making repairs will not be done on the top or roof of any car, locomotive, or other high equipment or high lading while under overhead contact wire, except by, or under, the supervision of Class “A” or “B” employee.

5.2 WORKING AROUND THIRD RAIL

- 5.201** All employees must have received AMT-2 instruction. Stand, walk or work in the area between the third rail and the adjacent running rail only in the performance of duty. Contractors must work under direction of Class “A” employees.
- 5.202** No work shall be performed between the running rail and the adjacent energized (LIVE) third rail until rubber mat/ blanket protection is provided by a qualified employee or until third rail is de-energized by a Class “A” employee. At this time tools equipped with wooden handles may be used as long as the employees’ hands do not come within 3 inches of the metallic part of the tool. This applies to ballast forks, shovels, spike lifters and similar wooden handle tools.
- 5.203** Only Class “A” employees may install, approved and tested. rubber mats/ blankets on energized (LIVE) third rail for the protection of others. Class “B” C&S employees may install rubber mats/ blankets for protection of C&S employees only.
- 5.204** Employees other than Class “A” employees are not permitted to dig or pass tools, equipment or material under energized third rail until a qualified employee provides rubber mat/ blanket protection or third rail is de-energized, tested de-energized and a warning device applied.
- 5.205** Rubber mats/ blankets must afford a minimum of 18 inches of coverage beyond the point where tools, equipment or material is being passed under energized (LIVE) third rail.

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SECTION 5. INSTRUCTIONS PERTAINING TO MAINTENANCE OF WAY PERSONNEL	

- 5.206** Do not use metallic tools, such as jacks, lining bars, claw bars, track wrenches and rail or tie tongs to work on a track within 4 feet of the rail nearest the third rail until the third rail is de-energized, tested de-energized and a warning device applied.
- 5.207** Only qualified Class “A” Third Rail Men may work on energized (LIVE) third rail.
- 5.208** Class “A” employees working on energized (LIVE) third rail will use properly tested and inspected rubber gloves with leather gauntlet combination and insulated tools. Gloves and tools shall be inspected for defects daily and have an up-to-date certification with a minimum 1000V rating.
- 5.209** Third rail maintenance and construction activities such as welding, brazing and huck applications shall not be performed under energized (LIVE) conditions. When performing these operations the third rail must be de-energized, tested de-energized and a warning device applied.
- 5.3 *OPERATION OF MAINTENANCE OF WAY
OR CONSTRUCTION EQUIPMENT (WITH
OR WITHOUT BOOM)***
- 5.301** When used in electrified territory, such equipment must be grounded in accordance with Maintenance of Equipment Specifications when it or employees on it could come within distances of overhead wires as specified below:

**SECTION 5. INSTRUCTIONS PERTAINING TO MAINTENANCE OF
WAY PERSONNEL****A. WIRES ENERGIZED (LIVE)**

With or without supervision of Class “A” employee:

- Not closer than fifteen (15) feet to transmission wires.
- Not closer than three (3) feet to catenary system.
- Not closer than three (3) feet to signal power wires.

B. WIRES DE-ENERGIZED (DANGEROUS TO LIFE) AND NOT GROUNDED

With or without supervision of Class “A” employee:

- Not closer than fifteen (15) feet to transmission wires.
- Not closer than three (3) feet to catenary system.
- Not closer than three (3) feet to signal power wires.

C. WIRES DE-ENERGIZED AND GROUNDED

Without supervision of Class “A” employee:

- Not closer than fifteen (15) feet to transmission wires.
- Not closer than three (3) feet to catenary system.
- Not closer than three (3) feet to signal power wires.

With supervision of Class “A” employee:

- Full contact with the wires is permitted, avoiding damage.

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- 5.302** If in the opinion of the foreman or the operator any hazard is involved, he must request the protection of a Class “A” employee.
- 5.303** When used in proximity to overhead catenary system, power lines and electrical apparatus, it is the responsibility of the operator to know that such equipment is grounded in accordance with Maintenance of Equipment Specifications. Equipment that is the property of others is subject to the same specifications.
- 5.4 *OPERATION OF MAINTENANCE AND
CONSTRUCTION ROADWAY
MACHINERY***
- 5.401** It is the responsibility of the operator to know that the boom and supporting frame of such machines are properly grounded.
- 5.402** Equipment that is property of others, unless properly grounded and supervised by a Class “A” employee, must not operate closer than fifteen feet to overhead electrified wires, or electrical apparatus.
- 5.403** The location and working hours of all such machinery close to overhead electrification wires, power lines, and electrical apparatus must be reported to the Train Dispatcher who will notify the Power Director.
- 5.404** When work is to be done within fifteen (15) feet of transmission wires or three (3) feet of all other energized conductors, or if, in the opinion of the foreman (or operator), any hazard is involved, he must request the protection of a Class “A” employee.

**SECTION 5. INSTRUCTIONS PERTAINING TO MAINTENANCE OF
WAY PERSONNEL****5.5 OPERATION OF WRECK EQUIPMENT**

- 5.501** When wreck equipment is necessary the Dispatcher or Power Director will promptly dispatch a Class “A” employee. The Class “A” employee shall report at once to the employee in charge and to the wreck foreman.
- 5.502** When wreck equipment is operating under overhead wires and it is not necessary for the boom to come within fifteen (15) feet of transmission wires or three (3) feet of the catenary system or signal power wires, such operation may be performed under the supervision of a wreck foreman, without requiring the protection of a Class “A” employee.
- 5.503** When it is necessary for the wreck equipment boom to come within fifteen (15) feet of transmission wires or three (3) feet of the catenary system or signal power wires, the wires must be de-energized, tested de-energized, and grounded, and Class “A” protection provided.
- 5.504** When it becomes necessary for the wreck equipment boom to come in contact with de-energized and grounded wires resulting in either upward or lateral pressure on wire, such operation shall be under the direction of a Class “A” employee. Wreck equipment not equipped with a cowl (wire guard) on tip of boom must not be allowed to come in contact with catenary system.
- 5.505** When necessary to have the catenary system drawn out of alignment or removed, the work shall be done by Electric Traction employees.

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5.506 Employees engaged in wrecking operations shall be protected from energized (LIVE) third rail by Class “A” employee. Third rail must be de-energized or approved protection provided.

5.507 When using outriggers, damage to third rail and associated apparatus must be avoided.

5.6 *TRACTION RETURN PROTECTION ELECTRIFIED TERRITORY*

5.601 Method of applying temporary rail jumpers in electrified territory when impedance bond side leads are to be removed or when neutral of bonds is to be opened

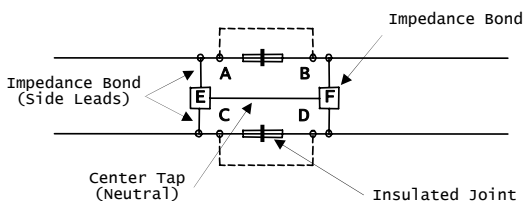
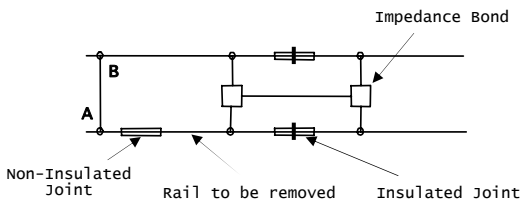


Figure 19

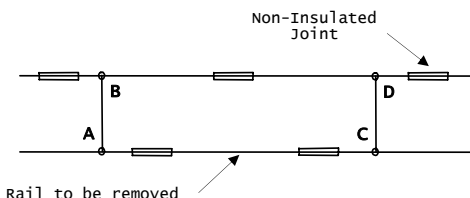
Make jumper connection's A - B and C - D before disconnecting side leads of impedance bond E or F, rails or opening neutral of bonds, and allow jumper connections to remain in place until impedance bonds are properly connected to rails. Jumpers must not be applied until use of track has been obtained and maintenance of way employee has protected apparatus and train movements.

5.602 Method of applying temporary rail jumpers in electrified territory when rail to which impedance bond is connected is to be removed from track.

**SECTION 5. INSTRUCTIONS PERTAINING TO MAINTENANCE OF
WAY PERSONNEL****Figure 20**

Make jumper connections A - B before impedance bond connection to rail is removed and allow connection A - B to remain in place until new rail is in place and impedance bond connected to it. Jumpers must not be applied until use of track has been obtained and maintenance of way employee has protected apparatus and train movements.

5.603 Method of applying temporary rail jumpers in electrified territory when rail is to be removed from track.

**Figure 21**

Make jumper connections A - B and C - D before rail or rail bonds are to be removed. When new rail is in place and joint bars tightened. Remove jumpers A - B and C - D after new rail, joint bars and rail bonds are properly installed. Jumpers must not be applied until use of track has been obtained.

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6 INSTRUCTIONS PERTAINING TO ELECTRIC TRACTION DEPARTMENT PERSONNEL

6.1 GENERAL

- 6.101** Do not work on or about electrical circuit, apparatus or equipment unless qualified. Employee must have full knowledge of its operating voltage and the instructions herein.
- 6.102** The Power Director is in charge of the electrical power network required for the operation of trains and the supervision of employees affecting the electrical operation. He is responsible to coordinate and maintain an accurate record of orders issued, and all circumstances, including relevant operating requirements, associated with switching and tagging necessary for clearance protection. It is the duty of the Power Director to insure that these instructions are rigidly adhered to and report any violations promptly.
- 6.103** Only Class “A” employees are permitted to request electrical lines or equipment for clearance protection, for the purpose of working on or to protect work on or near electrical lines or equipment on behalf of themselves or others and to perform any or all switching and tagging tasks associated. Employees who pass required examinations within the Electric Traction department will be classified as Class “A”.
- 6.104** The Assistant Division Engineer – Electric Traction and Director -Operation and Maintenance/Electric Traction, maintains the current list of Class “A” employees.
- 6.105** Class “A” employees must have in their possession while on duty a copy of all

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applicable schematics or prints of the work zone, a copy of their Safety Rules (NRPC-1908), the Electrical Operating Instructions (AMT-2), NORAC Operating Rules, and RWP certification when required to work along the right-of-way.

6.106 In reporting to duty, the person in charge must advise the Power Director of forces working in his assigned territory and confirm power outage requirements.

6.107 Power Directors must be advised of all personnel entering any substation or ET enclosure.

6.2 *MINIMUM APPROACH DISTANCES*

6.201 Minimum approach distances must always be maintained between the employees and all exposed energized lines or equipment while work is being performed. Minimum approach distances are measured between the employee or the end of a tool, equipment or material being used and the exposed energized parts.

6.202 All work on electrical line or equipment having a normal voltage above 480 volts AC, must be de-energized, tested de-energized and properly grounded prior to working closer than the minimum approach distances.

6.3 *PERSONS AND/OR EMPLOYEES WORKING WITH ON-TRACK EQUIPMENT*

6.301 The foreman and operator of the ET on-track equipment will conduct a documented Job & On-Track Briefings to ensure that all persons assigned to work on the equipment have received and thoroughly understand his instructions. The foreman and operator

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of the equipment are responsible for the strict observance and enforcement of these instructions.

- 6.302** When a Class “A” employee is assigned to obtain a clearance, the foreman must advise him of the designation of the circuit to be de-energized, extent of clearance, location and nature of the work to be performed.
- 6.303** After the required clearance has been received, the Class “A” employee must personally report to the foreman with the standard clearance form showing the designation of circuit de-energized and the extent of clearance received.
- 6.304** The employee who has obtained the clearance shall:
- A. Test de-energized, any Class “A” employee or a Trainee under the direction of a Class “A” employee can test to ensure that circuit is de-energized using approved voltage tester.
 - B. Direct the raising of the grounding pantograph and verify contact with wire (when available).
 - C. Explain to all persons involved the designation of the circuit de-energized and the extent of the clearance obtained. Each employee must repeat the information received and sign his name on the back of the clearance indicating his understanding of the clearance.
 - D. Under no circumstances allow a Trainee to be the first person to ascend to the top of the equipment.
 - E. Direct the application of the required grounding devices.
 - F. Will direct the attention of each person to

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the location of energized circuits in proximity to the work.

- G. The foreman or Class “A” employee will be assigned so that they can observe the movements of all persons on top of the equipment at all times. Where this is not practical, they must assign a Class “A” employee to protect employees not within their immediate vision.
- H. Upon completion of the work immediately advise all persons that the circuit will be energized. Each person must repeat to him the information received and sign his name on back of the clearance indicating his understanding of the information.
- I. Direct the removal of grounding devices and under no circumstances will a Trainee be the last person to descend from the top of the equipment and personally direct the lowering and locking down of the grounding pantograph. The operator will ensure that the pantograph is lowered and secure before moving equipment.

6.305 When the foreman leaves the immediate vicinity where work is being performed, he must assign a Class “A” employee to take charge until his return and must advise each member in the gang the name of the person assigned to take charge.

6.306 When it appears work can not be completed in the time allotted, the Power Director must be notified as soon as possible.

6.307 An employee receiving switching orders must write them down and repeat them back before any switching is performed. Switching form NEC-182 will be utilized for this purpose. Carry this order and refer to it

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constantly while switching: **DO NOT
DEPEND ON MEMORY IN EXECUTING
SWITCHING ORDERS.** Operate equipment
in sequence issued.

6.308 When adjacent circuits are energized and it is necessary to work in proximity to the energized wires, this work shall be personally supervised by the foreman or Class “A” employee in charge, who must take precautions necessary to prevent tools, apparatus or other Class “A” employees from approaching within three (3) feet of wires energized at nominal 12,000 volts, except for the purpose of catenary inspection and maintenance, eighteen (18) inches is permissible at steady spans.

6.309 Under no circumstances may other than Class “A” employees or ET trainees under the direction of a qualified Class “A” Employee be permitted to approach within three (3) feet of the energized catenary system.

6.4 *INSTRUCTIONS FOR ELECTRIC TRACTION DEPARTMENT EMPLOYEES REMOVING POWER FOR ELECTRIC TRACTION DEPARTMENT WORK.*

6.401 The foreman will conduct a documented Job & On-Track Briefings to ensure that all persons assigned to the work have received and thoroughly understand his instructions. The foreman is responsible for the strict observance and enforcement of these instructions.

6.402 When a Class “A” employee is assigned to obtain a clearance, the foreman must advise him of the designation of the circuit to be de-energized, extent of clearance, location and nature of the work to be performed.

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- 6.403** After the required clearance has been received, the Class “A” employee must personally report to the foreman with the standard clearance form showing the designation of circuit de-energized and the extent of clearance received.
- 6.404** The employee who has obtained the clearance shall:
- A. Test de-energized (any Class “A” employee or a Trainee under the direction of a Class “A” employee can test to ensure that circuit is de-energized using approved voltage tester).
 - B. Explain to all persons involved the designation of the circuit de-energized and the extent of the clearance obtained. Each employee must repeat the information received and sign his name on the back of the clearance indicating his understanding of the clearance.
 - C. Direct the application of the required grounding devices.
 - D. Will direct the attention of each person to the location of energized circuits in proximity to the work.
 - E. Be located so that they can observe the movements of all persons on top of the equipment at all times. Where this is not practical, they must assign a Class “A” employee to protect employees not within their immediate vision.
 - F. Upon completion of the work immediately advise all persons that the circuit will be energized. Each person must repeat to him the information received and sign his name on back of the clearance indicating his understanding of the information.

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G. Direct the removal of grounding devices.

- 6.405** When the foreman leaves the immediate vicinity where work is being performed, he must assign a Class “A” employee to take charge until his return and must advise each member in the gang the name of the person assigned to take charge.
- 6.406** When it appears work can not be completed in the time allotted, the Power Director must be notified as soon as possible.
- 6.407** An employee receiving switching orders must write them down and repeat them back before any switching is performed. Switching form NEC-182 will be utilized for this purpose. Carry this order and refer to it constantly while switching: **DO NOT DEPEND ON MEMORY IN EXECUTING SWITCHING ORDERS.** Operate equipment in sequence issued.
- 6.408** When adjacent circuits are energized and it is necessary to work in proximity to the energized wires, this work shall be personally supervised by the foreman or Class “A” employee in charge, who must take precautions necessary to prevent tools, apparatus or other Class “A” employees from approaching within three (3) feet of wires energized at nominal 12,000 volts.
- 6.409** Under no circumstances may other than Class “A” employees or ET trainees under the direction of a qualified Class “A” Employee be permitted to approach within three (3) feet of the energized catenary system.

- 6.5** ***EMPLOYEES ASSIGNED TO PROTECT
OTHER THAN ELECTRIC TRACTION
EMPLOYEES***
- 6.501** The Class “A” employee will be responsible for the protection of each person to which he has been assigned.
- 6.502** At the beginning of each tour of duty, the Class “A” employee will participate in or conduct a documented Job & RWP Briefing to instruct the foreman and all employees in the gang of the dangers surrounding them, calling their particular attention to any hazards to be encountered by the nature of the work to be done.
- 6.503** When there are two or more Electric Traction employees engaged on the same operation, the Class “A” employee obtaining the clearance shall have a thorough understanding with the Electric Traction employee as to clearance obtained and grounds to be applied. The Electric Traction employee must sign the clearance form showing that they understand the clearance obtained.
- 6.504** When the clearance has been obtained and the wires, equipment or apparatus de-energized, tested de-energized and grounded, the Class “A” employee will indicate to the foreman of the gang, the wires, equipment or apparatus from which power has been removed and the location of the grounding devices - (When practical in view of applied ground devices). The Class “A” employee will obtain, on standard clearance form, the signature of the foreman indicating that he has been so instructed, and will confine their work within the limits as outlined by the Class “A” employee. The Class “A” employee must indicate to the

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foreman and all employees in the gang the structure or portion of the structure on which work may be performed.

6.505 Class “A” employees who de-energize third rail will first obtain a permit from the Power Director indicating the limits of the de-energized circuit or apparatus. He then will demonstrate that the third rail is de-energized by:

- A. Applying a test on an energized circuit to verify a functional meter
- B. Perform the test with the same meter on the de-energized circuit he received a permit on
- C. Applying a final test to the energized circuit to verify functional meter.

After verification of a functional meter and a de-energized circuit, a third rail warning device will be applied to an energized third rail to verify its functionality and then connected to the permitted/ de-energized third rail. In the event that the circuit is re-energized for any reason when protection is being provided, the warning device will give an audible and visual warning. Except for ground application, a third rail Class “A” employee will conduct himself like any other Class “A” employee.

6.506 The Class “A” employee will inform the foreman when any employee is not working safely or will not comply with instructions. Should the foreman fail to maintain safe working conditions or when, in the opinion of the Class “A” employee, any person in the gang does not understand the instructions for any reason whatever, such person shall not be permitted to work or observe, the Class “A” employee will immediately stop work and notify the Power Director and the

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Power Director shall be notified.

- 6.507** The Class “A” employee will place himself in a position, which will permit close observation of all locations within proximity to the energized wires/ third rail and from which he can best, observe the movement of all persons toward such locations.
- 6.508** The Class “A” employee will, under no condition, assume that the person having been instructed by him will adhere strictly to such instructions, but will remain alert to detect any potential violations of those instructions.
- 6.509** The Class “A” employee shall not engage in any work himself, nor shall he converse with the other persons or foreman, any more than is necessary to convey instructions he has to give them.
- 6.510** When the Class “A” employee leaves for any reason, he shall notify the foreman to stop all work in the vicinity of the wires, and not resume until advised to do so. He will obtain the foreman's signature on standard clearance form, and personally observe that all persons and equipment are moved to a safe distance from the wires before his departure.
- 6.511** When the clearance is to be released, the Class “A” employee will so inform the foreman and will personally observe that all persons have moved to a safe distance from the wires, equipment or apparatus to be energized, before removing the grounding devices. He will obtain the signature of the foreman, on standard clearance form stating that he has been advised that the wires,

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equipment or apparatus will be energized, and that they will remain at a safe distance from them until informed otherwise by the Class "A" employee.

- 6.512** Upon completion of 6.511, the Class "A" employee will advise any additional Electric Traction Employee of clearance being release and they must sign his name on back of the clearance indicating his understanding of the information that the circuit will be energized.